

Synergistic Effects of Multiple Stressors on Forest Resistance, Resilience, and Response

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Ecological Forestry in the Context of Climate Change

Seminar Series

FWS Forest Ecology Working Group



**Oregon State
University**

College of Forestry



Land Acknowledgement

I am committed to taking people and the institutions with whom I work beyond the land acknowledgement to find ways to support and empower Native Americans and their communities. I am mindful of the truth that for thousands of years the Mary's River, or Ampinefu, Band of the Kalapuya have been in relationship with the land where Oregon State University in Corvallis, Oregon now sits, and I now live and work. I acknowledge that they were forcibly removed to reservations in Western Oregon, and that their living descendants are part of the Confederated Tribes of Grand Ronde Community of Oregon and the Confederated Tribes of the Siletz Indians. I value the long and deep interactions they have with the land, and aspire to find ways to honor and manifest that value in my work and life.

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**THIS IS
KALAPUYAN
LAND**

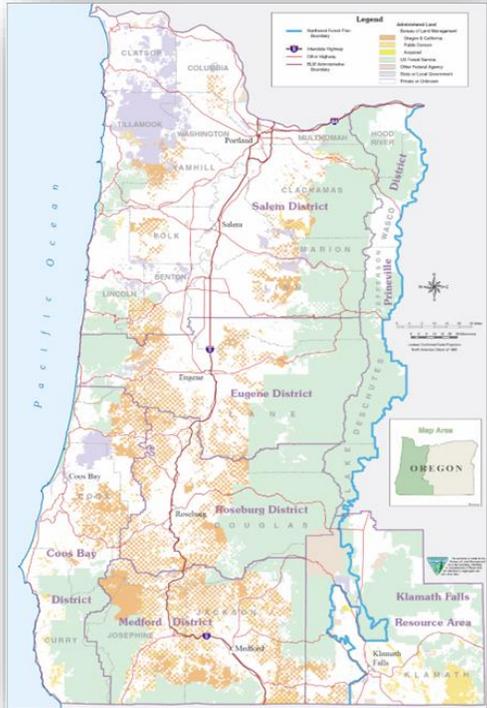


- Impacts and effects of multiple stressors on forest systems
- Adaptive strategies for managing forests with multiple stressors
- Collaborative work with tribes and Indigenous Knowledge





Forests of the Future?



2020 Labor Day Fires, Oregon

Forest management that allows for a broader array of ecological functions creates forests more resilient to wildfire and other disturbances. This requires partnership across cultures to innovate solutions.



Harvard Forest hemlock mortality:

- Woolly adelgid moth
- Decline and shifts in water resources



Braiding Indigenous Knowledge and Western Science for Climate-Adapted Forests:

An Ecocultural State of Science Report

EXECUTIVE SUMMARY | OCTOBER 2023

Eisenberg et al. 2023

THE PROBLEM: North American forests are experiencing unprecedented challenges due to extreme wildfires, pathogen and insect outbreaks, heat stress, drought, rapid development, and invasive species. Exacerbated by climate change, these threats collectively diminish economic values, cultural values, and habitat. Particularly because of fire exclusion, contemporary and historical management policies are root causes of current forest conditions.

Our report summarizes findings that braid together Indigenous Knowledge (IK) and Western Science (WS) to support climate adaptation of forest landscapes. Our writing team's cultural, geographic, and disciplinary diversity enables us to provide guidance that can enhance resilience and sustainability. This compendium builds on federal directives¹ to respectfully and intentionally braid IK and WS systems in a Two-Eyed Seeing approach² that informs climate-adaptation strategies to conserve forests. We conclude the Executive Summary of our report with five recommendations to catalyze proactive approaches to address threats to North American (NA) forests.

Adaptive Strategies

Braiding Sweetgrass: Increasing Climate Resiliency of US Forests

Report for the White House

- Indigenous Knowledge + Western Science
- An Indigenous-led decolonized report
- 30 co-authors, 1/3 of them Indigenous
- Tribal forestry perspectives
- Rethinking the idea of forest “reserves”
- Active stewardship to restore forests
- Published by Dec. 31, 2023
- Presented at the Society of American Foresters Science Summit, Washington, DC March 2024
- Intended to inform federal policy



Cultural Burning



1845 Henry Warre, *Valley of the Willamette River*



Pollard 1910, Blackfoot Burning the Prairie

Lake et al. 2017, Returning fire to the land: celebrating traditional knowledge and fire. *Journal of Forestry* 115(5):343-353.

Indigenous Knowledge (IK)

Knowledge and practices passed orally from generation to generation informed by strong cultural memories, sensitivity to change, and values that include reciprocity. Rooted in spiritual health, culture, and language, IK is a “way of life.”

Kimmerer 2000



Christi Belcourt, *Wisdom of the Universe*, 2014

This contrasts with the worldview held by Europeans who colonized North America, for whom economics was a principal driver of their relationship with nature. This enabled them to dispossess Indigenous People of their land and of species crucial for their sustenance.

Seventh Generation Principle

Based on the Haudenosaunee (Iroquois) philosophy that decisions we make today should result in a sustainable world seven human generations into the future.



Settler Colonialism



John Gast, 1872
American Progress

Policy of a foreign polity seeking to extend or retain its authority over other people or territories, to develop or exploit them to benefit the colonizing country and help the colonies modernize in terms defined by the colonizers

Impacts of Settler Colonialism



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Tribal Sovereignty and Self-Determination Rights

Dawes Act of 1887 (aka General Allotment Act) recognized Tribal sovereignty, defined as the right of Indigenous peoples to self-governance and self-determination.

Implemented this act unevenly, on a Tribe-by-Tribe basis.

Indian Termination policies from 1953-1964 abrogated these rights.

Indian Self-Determination and Education Assistance Act of 1975 and **Tribal Self-Governance Act of 1994** reinstated Indigenous peoples' sovereignty rights and empowered them to manage their lands.

Securing such rights in practice continues to challenge many Tribal Nations, particularly regarding natural resource and subsistence treaty rights.

Settler colonialism remains prevalent, regardless of institutional DEI mandates.

A New Era for IK and Sovereignty Rights



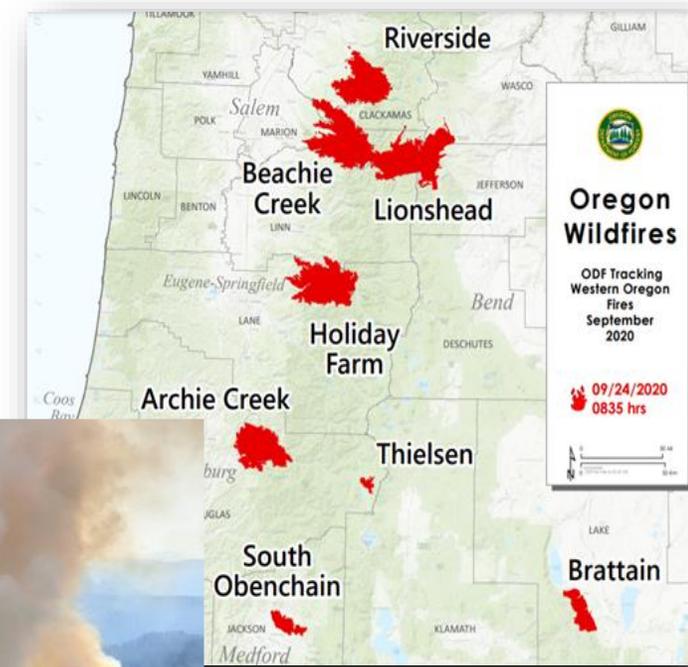
Federal Policy Context: *Tribal Self-Determination*

July 2021: Presidential Justice40 Initiative

November 2021: White House Office of Science and Technology Policy (OSTP), Council on Environmental Quality (CEQ) Memorandum on ITEK and Federal Decision-making

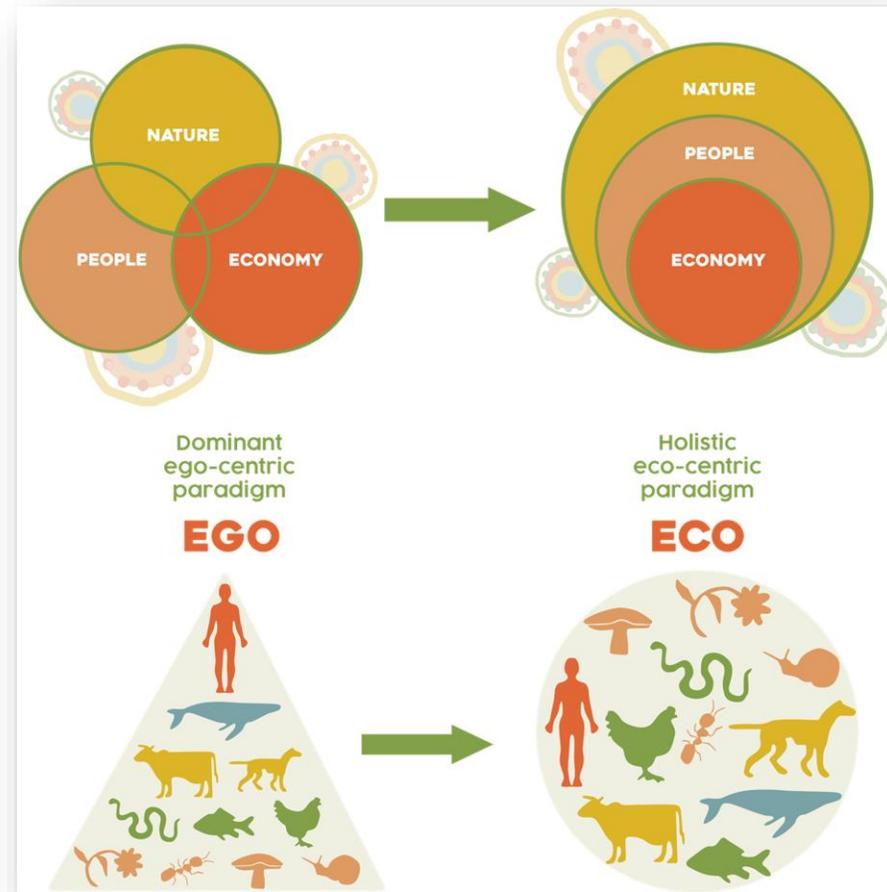
November 2022: White House OSTP CEQ Memo, Guidance on IK

November 2022: Joint Secretarial Order 3403, trust responsibility to Tribes in stewardship of Federal lands and waters



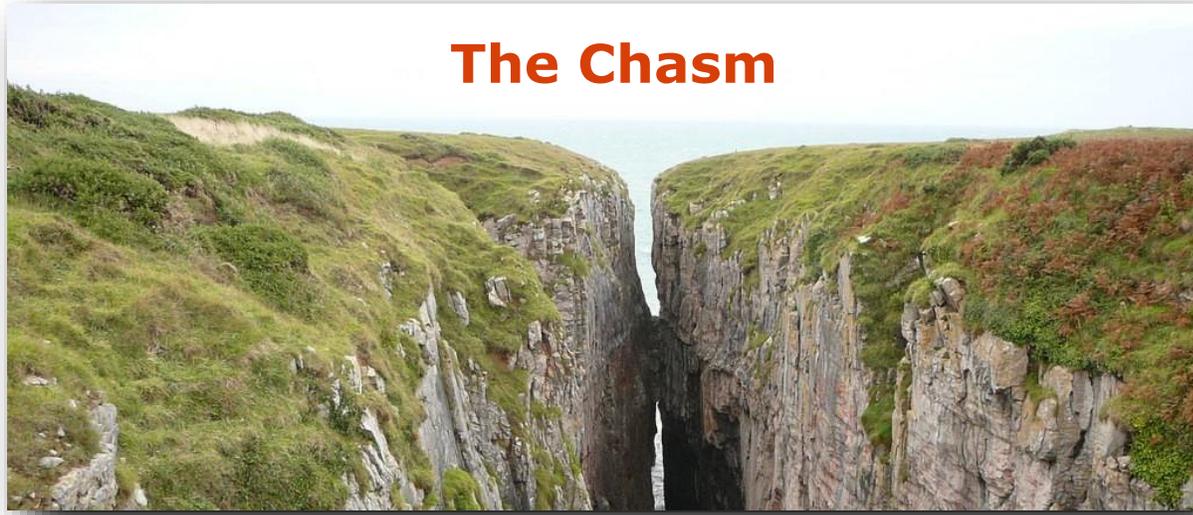
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Two Different Worldviews



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The Chasm



TEK

Abstract
Qualitative
Inclusive
Intuitive
Diachronic (long-duration,
intergenerational)
Humans as part of nature
Community data
Holistic
Matriarchal
Value-driven
Part of daily life
Expansive

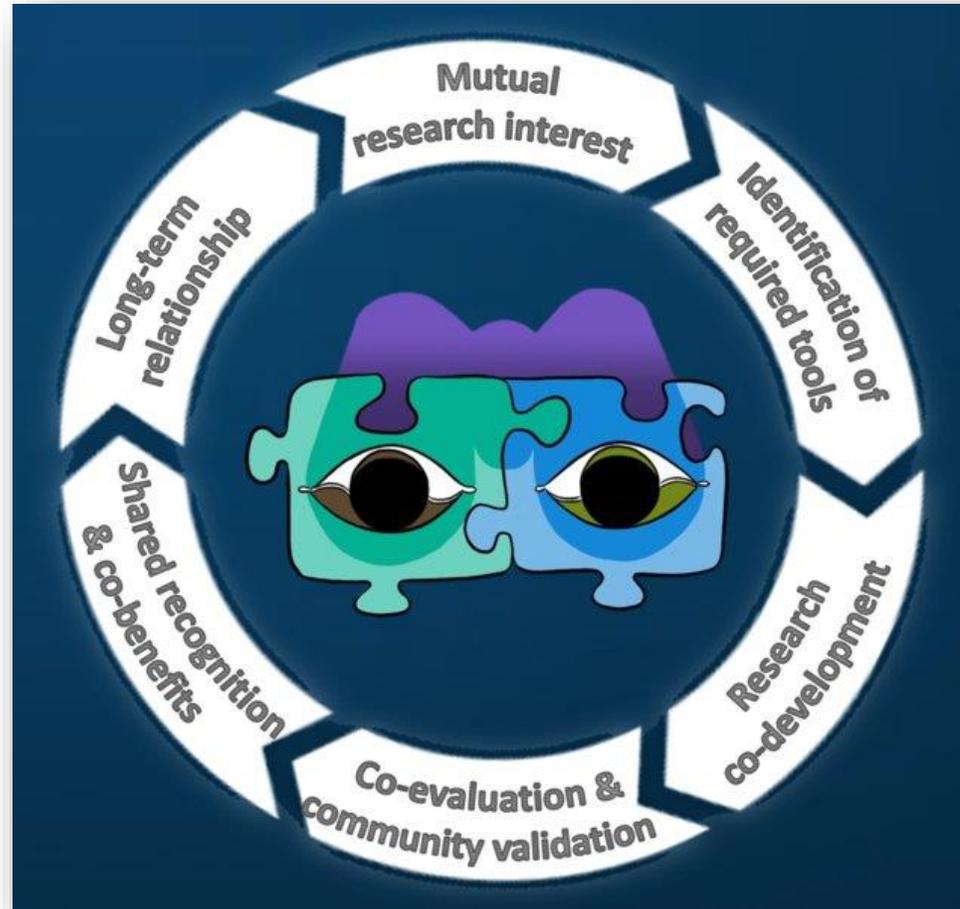
Western Science

Concrete
Quantitative
Exclusive
Intellectual
Synchronic (short time-series, broad
generalities)
Humans separate from nature
Outside scientific specialists' data
Linear
Patriarchal
Unbiased
Aristotelian hypothesis testing
Reductionist

IK + Western Science = Two-Eyed Seeing

Braiding together IK and Western Science epistemologies in adaptive management is called Two-Eyed Seeing.

By combining the empirical strengths and logic of Western Science and the insights and wisdom of IK, one gains binocular vision that inspires solutions to challenging natural resource problems.



A stepwise, circular framework for intercultural collaborative partnerships with Indigenous peoples

Reid et al. 2020

Bridging the Chasm: Two-Eyed Seeing and *Ecocultural* Restoration

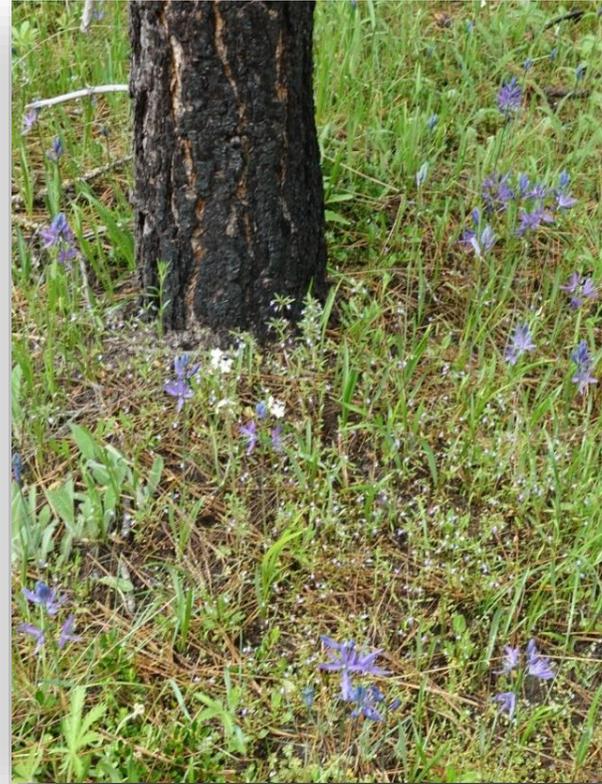
Braids ecological knowledge derived from practitioner experience, local and IK and Western science

Based on intercultural collaboration for partnership; can help conserve public lands

Increases resiliency to climate change and other stressors, while supporting Indigenous ecosystems and their cultures

Ecological restoration: the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Ecocultural restoration: the process of restoring key historic pre-contact, pre-industrial ecosystem structures, processes, and functions, and the Indigenous cultural practices that helped shape ecosystems.



Confederated Salish
Kootenai Tribes,
NW Montana
Camas Restoration

Indigenous Natural Resource Office and Traditional Ecological Knowledge (TEK) Lab

Program Summary

- An Indigenized gathering place to develop relationships and allyships across cultures
- The TEK Lab explores, facilitates, and honors the synergies between TEK, Western science, and other ways of knowing.
- By creating partnerships with Tribal Nations that honor sovereignty rights and G2G relationships, we are helping decolonize and re-Indigenize the practice of science and advance holistic, systems-based thinking.
- By braiding together multiple ways of knowing, we help empower Tribal Nations and create opportunities for Tribal youth in higher education to find solutions to some of humanity's most pressing conservation challenges.



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Principles and Best Practices for working with IK and Partnering with Tribal Nations

- Acknowledge historical context of past injustices.
- Practice early and sustained engagement.
- Earn and maintain trust by being transparent, open about ideas and agendas, and honest at all times.
- Respect different processes and worldviews.
- Recognize, respond to, and adapt to challenges with cultural humility.
- Consider supporting co-stewardship and co-management partnerships.
- Support co-production of knowledge.
- Provide ample funding to Tribal Nations at each step of partnership.
- Share power and decision-making authority with Tribal partners.

https://www.forestry.oregonstate.edu/sites/default/files/COF%20Strategic%20Plan%202023-2027%20Digital_0.pdf

Projects and Partnerships

BLM Pacific Northwest (PNW) Tribal Forest Restoration and Native Seed Project (2022-2024)

3-year ethnobotany, seed collection, and Tribal conservation corps ecocultural restoration pilot project

Vision: Help create forests more resilient to climate change, using IK and best Western science to build capacity within Tribal Nations

Study Site: Oregon BLM O&C and Tribal lands,

Partners: Five Western Oregon Tribal Nations, Society for Ecological Restoration, Institute for Applied Ecology, Forest Bridges

Goals:

- Collect plant material for restoration
- Create job and education opportunities for Tribal youth
- Co-create ecocultural restoration plan
- Honor Tribal sovereignty and nation-to-nation relationships
- Create Federal and Tribal lands more resilient to climate change

Research Team: Lead PI, Cristina Eisenberg; Co-PIs Thomas H. DeLuca, Christopher J. Dunn, Thomas Kaye, Si Gao, and Luhui Whitebear

Funding: \$5M **Source:** Native Plant Conservation Program, DOI; Peggy Olwell



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Projects and Partnerships

OSU/BLM/Fort Belknap Indian Community Grassland Restoration Project (2019-2028)

9-year ethnobotany, seed collection, and Tribal conservation corps ecocultural restoration pilot project

Vision: Help create grasslands more resilient to climate change, using ITEK and best Western science to build capacity within Tribal Nations

Study Site: Northern Great Plains of Montana, BLM and Tribal lands,

Partners: Fort Belknap Indian Community, Society for Ecological Restoration

Goals:

- Collect plant material for restoration
- Create job and education opportunities for Tribal youth
- Co-create ecocultural restoration plan
- Honor Tribal sovereignty and nation-to-nation relationships

Research Team: Lead PI, Cristina Eisenberg; Co-PI Thomas H. DeLuca

Funding: \$2.7M **Source:** Native Plant Conservation Program, DOI; Peggy Olwell



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COLLEGE OF FORESTRY

Forests of the Future?

Hagman et al. (2021). Evidence for widespread changes in the structure, composition, and fire regimes of Western North American Forests.



- Managed for a broader array of ecological functions
- Resilience to wildfire and other disturbances
- Climate change mitigation
- Requires partnership/collaboration across cultures—two-eyed seeing.

Q: What could holistic forest management that includes IK and Western Science look like?

Questions?

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<https://www.forestry.oregonstate.edu/intro>

<https://tek.forestry.oregonstate.edu/>



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